National Institute of Environmental Health Sciences

The effect of environmental conditions on ergosterol and trichothecene content of naturally contaminated oat grain

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Abstract:

Oat plants, similar to other cereals, are susceptible to invasion by fungal pathogens and saprophytes, but the severity of disease symptoms and the extent of fungal growth depend to a considerable degree on environmental conditions. This study aimed to analyse the dependence of ergosterol and trichothecene production in oat grain on environmental conditions. Three oat cultivars were cultivated in 10 localities across Poland under natural conditions of fungal infection. Analysis of the effect of weather conditions during the growing season on ergosterol content and total trichothecene Fusarium toxin content in grain showed that they are negatively correlated with the sum of precipitation in the dry month of June, i.e. at the flowering stage of oats. Significant rainfall in July (256 % multiannual average) resulted in a considerable growth of saprophytic fungi and, as a consequence, in high ERG levels in grain (mean 14.0 mg/kg). Although the total trichothecene content was relatively low (< 150 microg/kg), a significant correlation was observed between this trait and ergosterol content of grain (r Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.7313). Higher values of correlation coefficients were recorded for the dependence of trichothecene A, as well as trichothecene A and NIV, and ERG levels, amounting to r Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.8703 and r Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.7748, respectively. This was probably caused by specific weather conditions manifested by slight precipitation during panicle flowering, which promoted the growth of pathogens (F. poae, F. sporotrichioides) producing trichothecenes A (T-2 toxin, HT-2 toxin and NIV). In addition, a significant influence of locality on values of both traits was recorded. Variation between cultivars was not significant.

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Biotoxin/Algal Bloom

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Poland

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease, Other Health Impact

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease (other): fungi in grains

Other Health Impact: toxins in grains

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified